

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

**0 103 283
B1**

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: 06.07.88

(51) Int. Cl.⁴: E 21 B 7/20, E 02 D 7/26,
E 02 D 7/22

(21) Application number: 83108909.9

(22) Date of filing: 09.09.83

(54) An apparatus for inserting a tool into the ground and continuously rotating it.

(30) Priority: 13.09.82 IT 2322182

(43) Date of publication of application:
21.03.84 Bulletin 84/12

(45) Publication of the grant of the patent:
06.07.88 Bulletin 88/27

(84) Designated Contracting States:
AT CH DE FR GB IT LI NL

(58) References cited:
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FR-A-1 083 891
FR-A-1 524 223
GB-A-1 094 201
GB-A-2 114 185
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Courier Press, Leamington Spa, England.

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Description

This invention relates to devices for insertion of rotating tools into the ground. Such tools are normally mounted at the end of a tube. For the sake of brevity, the word "tube" will be used hereinafter for indicating any elongate drilling means which may be caused to penetrate into the ground.

An apparatus of this type has been described in US-A-3,763,654. In this patent, the insertion of thin long tubes is foreseen. These can penetrate into the ground only owing to the excavating effect of a water jet outflowing from the tube end, whereby this device can be used only in sandy grounds. The embodiment according to US-A-3,763,654 provides that the tool is axially and rotatably moved. The axial movement is given by three vertical jacks which cannot ensure a simultaneous advancement of the three pistons imparting the thrust, and accordingly a perfectly axial advancement of the tool. Moreover the rotary movement takes place along small circle arcs, and is controlled by one or two horizontally arranged jacks. Therefore, an even rotation at a high r.p.m. cannot be carried out.

Additionally, the jaw grip, also controlled by three jacks may occur any time at a different position, not exactly coincident with the axis of the device controlling the tool advancement and rotation. This could cause the distortion of the tool carrier tube and inaccuracies in hole execution.

This device of the prior art allows only the use of drilling devices for which the rotation can be discontinuously imparted; for example, use cannot be made of tricones, diamonded tools for the drilling of rocks or alluvial grounds, etc.

GB-A-1,094,201 discloses an apparatus for inserting and rotating tools penetrating into the ground, said apparatus having a hollow implement for selectively gripping and rotating a tool carrier tube which penetrates into said hollow implement.

Moreover, said implement comprises an actuating head for maintaining said tool carrier tube in rotation by a motor and a suitable kinematic chain driving a rotating hollow means.

The vice for gripping the tube consists of a plurality of gripping means operated by jacks, which also rotate. Therefore the mass involved in the rotation is considerable and prevents a high revolving speed. On the other hand the gripping means as foreseen do not assure the centering of the tube with respect to the rotating head.

Therefore, it is the object of the present invention to impart a continuous rotation, also at a high rate of r.p.m., to a long tool carrier tube, while exerting thereon a perfectly centered thrust coaxial with the axis of rotation of said tool carrier tube.

The above object has been achieved as specified in claim 1. Other advantageous improvements are described in claims 2-4.

The invention will now be further explained

with reference to an exemplary embodiment as shown in the accompanying drawings, in which:

Fig. 1 is a schematic side view showing an apparatus for pile driving on which an apparatus according to the invention is mounted;

Fig. 2 is an axial sectional view showing the vice forming part of the apparatus;

Fig. 3 is a sectional view taken at right angles to the apparatus axis;

Fig. 4 is a sectional view according to VVXYZ of Fig. 5 showing the actuating head; and

Fig. 5 is a plan view of the head shown in Fig. 4.

Referring first to Fig. 1, it will be seen that the inventive apparatus comprises an actuating head 1 mounted on a column 3 carried by a structure 4 movable on tracks, wheels or sliding blocks 5. Said actuating head 1 is vertically driven along the column 3 by known means provided on the column, which applies axial forces relative to tube T and directed in both directions that is forces serving both to drive the tube T into the ground and withdraw it. The actuating head 1 performs the function of causing the hollow central shaft 15 and sleeve 16 integral therewith to rotate by means of two hydraulic motors 23 (Fig. 4).

The vice 2 is provided integral with the sleeve 16. Its function is that of selectively gripping and disengaging the tube T. Both said head 1 and vice 2 are hollow, so as to allow the passage therethrough of said tube T which projects below and above thereto. After the tube has been gripped, said head 1 and vice 2 moved downward. When the positions 1a and 2a, shown by broken lines in Fig. 1, are reached respectively by vice and head, said vice releases the tube T and moves upward along the tube to grip it again at the position shown by full line.

Referring now to Figs. 4 and 5, the construction of the actuating head 1 will now be explained. The outlet shaft 40 of each hydraulic motor 23 can be connected to both the pinion 41 and gear 42 by means of the clutch 49. Said pinion 41 and gear 42 respectively mesh with the gear wheels 43 and 44 integral with the shaft 45, on which the pinion 46 is also mounted. The latter drives the wheel 47 integral with the hollow shaft 15.

Said hollow shaft 15 is slidably connected to a sleeve 16 which is integral for rotation with the shaft 15, but axially free. The sleeve 16 has an integral flange 16a, to which the flange 37a of said vice 2 is bolted (Figs. 2 and 3). Thus, as soon as the free stroke of said sleeve 16 is resumed, the axial displacement caused by column 3 can be transferred to the vice 2. The torque produced by the hydraulic motors 23, is transferred to the vice 2 which thus causes the rotation of tube T.

The vice 2 has a ring 37 coaxial with the hollow shaft 15. Said ring 37 has a flange 37a which is made integral with the flange 16a. Said ring 37 is provided with ears 37b, each of which having a rod 48 pivoted thereto by a pin 48a. The movable jaws 33 are secured by screws 36 to the end of rods 48, so that such jaws are pendulum mounted. Thus, they can be readily replaced by other jaws of different sizes, such as to accommo-

date tubes T of different diameters. At the rear, each jaw 33 has a sloping surface 33a cooperating with the sloping surface 27a of a plate 27 mounted on a collar 26 providing for radially displacing said jaw 33 whenever said collar is axially moved. Said jaw 33 is held at opening position by springs 30.

The axial movement carried out by the collar 26 is imparted to the latter by a hollow jack 50 which does not rotate. The jack 50 is supported by the ring 37 through the two thrust bearings 21 and bushing 28 and is arranged concentrically to the ring 37 and sleeve 16. It consists of a hollow piston 29 and jacket 38. The piston 29 is axially secured to the ring 37 by screws 29a and flat bushing 39 penetrating into a notch 39a integral with said piston 29. The jacket 38 is axially movable together with the collar 26 which does not rotate. This is provided with a notch 26a, in which the flat bushing 59 slides. Bushing 59 is integral with said jacket 38 by the screw 24. Through the sloping surfaces 27a and 33a said collar 26 radially operates the jaws 33. The oil, as selectively introduced by connections 20 (only one of which is shown in Fig. 2), supplies for example the chamber A, causing the jacket 38 to be upward moved and thus releasing the tube T. On the other hand, the clamping of the latter is carried out when oil under pressure is introduced into the chamber B.

Thus, it will be seen that a perfectly centered operation of the vice 2 is ensured. This clamping can be indefinitely repeated at each gripping of tube T.

Claims

1. An apparatus for inserting and rotating tools penetrating into the ground, providing a hollow implement for selectively gripping and rotating a tool carrier tube (T) which penetrates into said hollow implement, comprising:

a) an actuating head (1) for maintaining said tool carrier tube (T) in rotation by a motor (23) and a suitable kinematic chain (41—47) driving a rotating hollow means (15, 16);

b) a gripping means (2) surrounding and holding the tool carrier tube (T) which is hydraulically operated so that said tube (T) can be activated by applying thereto a torque and an axial force in any direction,

characterized in that the gripping means is formed by a vice (2) made integral with said rotating hollow means (15, 16), said vice being operated by a non-rotating hollow jack (50) arranged concentrically to said rotating hollow means (15, 16) and having an axially secured hollow piston (29), while the jacket (38) thereof is axially movable and controls the radial displacement of tube gripping jaws (33) by axially moving a non-rotating collar (26) having a plate (27) with an inclined surface (27a) which collaborates with an inclined surface (33a) of the gripping jaws (33) pendulum mounted on the vice (2).

2. An apparatus as claimed in claim 1 charac-

terized in that said jaws (33) are pendulum mounted with a suspension pin (48a) integral with the rotating hollow means (15, 16).

3. An apparatus as claimed in claim 2, characterized in that said jaws (33) are interchangeable to accommodate different diameters of the tube (T).

4. An apparatus as claimed in any of the preceding claims, characterized in that said head (1) is provided with a floating sleeve (16), so that for some length the advancement of said tube (T) is independent of the thrust exerted on the implement.

Patentansprüche

1. Vorrichtung zum Eintreiben und Drehen von Bohrwerkzeugen in den Boden, nach der ein hohles Gerät vorgesehen ist, das ein Werkzeughalterrohr (T) selektiv erfassen und drehen lassen kann, das in das hohle Gerät eindringt, welches

a) einen Betätigungskopf (1), der das Werkzeughalterrohr (T) mittels eines Motors (23) in Drehung hält und eine zweckmäßige kinematische Kette (41—47), die ein drehbares Hohlmittel (15, 16) betätigt,

b) ein Greifmittel (2), das das Werkzeughalterrohr (T) umfaßt und abstützt, wobei das Mittel hydraulisch in der Weise betätigt wird, daß das Rohr (T) betätigt werden kann, wobei an demselben ein Drehmoment und eine Längskraft in jeder Richtung aufgebracht wird,

aufweist, dadurch gekennzeichnet, daß das Greifmittel aus einem am drehbaren Hohlmittel (15, 16) befestigten Schraubstock (2) gebildet ist, der von einem hohlen nicht drehbaren Hebebock (50) betätigt wird, der konzentrisch zum drehbaren Hohlmittel (15, 16) angeordnet ist und einen hohlen axial befestigten Kolben (29) hat, während seine Laufbuchse (38) axial beweglich ist und die radiale Verschiebung der Greifbacken (33) des Rohres steuert, wobei axial ein nicht drehbarer Bund (26), der eine Platte (27) mit schräger Fläche (27a) hat, die mit einer schrägen Fläche (33a) der Greifbacken (33) zusammenarbeitet, die pendelnd am Schraubstock (2) montiert sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Backen (33) mit einer Pendelaufhängung oder einem Zapfen (48a) fest am drehbaren Hohlmittel (15, 16) montiert sind.

3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Backen (33) auswechselbar sind, sodaß sie an verschiedene Durchmesser des Rohrs (T) angepaßt werden können.

4. Vorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Kopf (1) mit einer schwebenden Buchse (16) versehen ist, sodaß er für eine gegebene Vorschubstrecke des Rohrs (T) vom dem auf das Gerät ausgeübten Druck unabhängig ist.

Revendications

1. Appareillage pour introduire un outil de perforation dans le terrain et le faire tourner de

façon continue, qui prévoit un instrument creux pouvant sélectivement saisir et faire tourner un tube (T) porte-outil qui pénètre dans ledit instrument creux, qui comprend:

a) une tête d'actionnement (1) pouvant maintenir en rotation ledit tube (T) porte-outil à l'aide d'un moteur (23) et une chaîne cinématique opportune (41—47) qui actionne un moyen creux rotatif (15, 16);

b) un moyen de prise (2) qui entoure et soutient le tube porte-outil (T), moyen qui est actionné hydrauliquement de sorte que ledit tube (T) puisse être actionné en appliquant à ce dernier un couple et une force axiale dans n'importe quelle direction,

caractérisé en ce que le moyen de prise est formé par un étau (2) solidaire dudit moyen creux rotatif (15, 16), ledit étau étant actionné par un vérin (50) creux, non rotatif, disposé concentriquement par rapport audit moyen creux rotatif (15, 16) et ayant un piston creux (29) axialement fixe, tandis que sa chemise (38) est axialement

mobile et qu'elle commande le déplacement radial des mâchoires (33) de prise du tube en déplaçant axialement un collier non rotatif (26) ayant une plaque (27) avec une surface inclinée (27a) qui collabore avec une surface inclinée (33a) des mâchoires de prise (33) montée à pendule sur l'étau (2).

2. Appareillage selon la revendication 1, caractérisé en ce que lesdites mâchoires (33) sont montées à pendule avec un pivot de suspension (48a) solidaire du moyen creux rotatif (15, 16).

3. Appareillage selon la revendication 2, caractérisé en ce que lesdites mâchoires (33) sont interchangeables, de façon à pouvoir s'adapter à différents diamètres du tube (T).

4. Appareillage selon n'importe laquelle des revendications précédentes, caractérisé en ce que ladite tête (1) est munie d'un manchon flottant (16) de sorte que sur une portion donnée l'avancement dudit tube (T) est indépendant de la poussée exercée sur l'instrument.

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